LISTING OF CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (Previously Presented) A tissue puncture system, comprising:

a tissue puncture closure device for partial insertion into and sealing of an internal tissue wall puncture, the device comprising:

a filament extending from a first end of the closure device to a second end of the closure device;

an anchor for insertion through the tissue wall puncture, the anchor being attached to the filament at the second end of the closure device;

a sealing plug slidingly attached to the filament and positioned adjacent to the anchor;

a tamping member disposed adjacent to the sealing plug;

a handle located at the first end of the closure device; and

an automatic driving mechanism located within the handle that tamps the sealing plug utilizing force generated by withdrawal of the closure device from the internal tissue wall puncture to move the tamping member toward the sealing plug, the automatic driving mechanism including a gear;

wherein the gear contacts the tamping member to move the tamping member, and at least a portion of the tamping member at least partially wraps around the gear.

2. (Canceled)

3. (Previously Presented) A tissue puncture system according to claim 1 wherein the automatic driving mechanism comprises a transducer for effecting movement of the tamping member toward the sealing plug upon withdrawal of the closure device from the tissue wall puncture.

4. (Previously Presented) A tissue puncture system according to claim 3 wherein the transducer comprises:

a storage spool with a portion of the filament wound thereon;

the gear engaged with the storage spool;

a tamping tube driver directly or indirectly driven by the gear.

5. (Previously Presented) A tissue puncture system according to claim 4 wherein the tamping tube driver comprises a flexible rack or a rigid tube slidingly disposed about the filament.

6. (Previously Presented) A tissue puncture system according to claim 4 wherein the storage spool rotates and drives the gear, and the gear drives the tamping tube driver, when the anchor is deployed and the closure device is retracted from the tissue wall puncture.

7. (Previously Presented) A tissue puncture system according to claim 4 wherein the gear comprises a gear train with a gear ratio of at least 2.5:1 with respect to the storage spool.

8. (Previously Presented) A tissue puncture system according to claim 4 further comprising a torque limiting clutch disposed between the storage spool and the gear.

9. (Previously Presented) A tissue puncture system according to claim 4 wherein the tamping tube driver is also the tamping member.

10. (Previously Presented) A tissue puncture system according to claim 3 wherein the transducer comprises an electronic switch at the proximal end of the closure device and a motor operatively connected to the electronic switch, wherein retraction of the closure device from the tissue wall puncture trips the electronic switch and activates the motor to move the tamping member toward the sealing plug.

11. (Previously Presented) A tissue puncture system according to claim 10 wherein the motor is a servo or solenoid that actuates a linear tamping force on the sealing plug.

12. (Previously Presented) A tissue puncture system according to claim 3 wherein the transducer comprises an optical sensor operatively connected to a motor for detecting or measuring withdrawal of the closure device from the tissue wall puncture and generating a signal upon withdrawal of the closure device from the tissue wall puncture.

13. (Previously Presented) A tissue puncture system according to claim 12 wherein the signal generated by the optical sensor is transduced to an electrical signal activating the motor to move the tamping member toward the sealing plug.

14. (Previously Presented) A tissue puncture system according to claim 1 wherein the filament extends at least partially back from the anchor toward the proximal end and re-engages the sealing plug.

15. (Previously Presented) A tissue puncture closure device for partial insertion into and sealing of an internal tissue wall puncture accessible through a percutaneous incision, wherein the closure device comprises a filament connected at a distal end to an anchor and to a sealing plug located proximal of the anchor for disposition and anchoring about the tissue wall puncture, wherein the improvement comprises:

means for automatically driving the sealing plug along the filament in a distal direction towards the anchor with a tamping tube simultaneously upon withdrawal of the closure device from the tissue wall puncture, wherein the means for driving the sealing plug are located within a handle of the device and includes at least one gear, at least a portion of the tamping tube at least partially wraps around the gear.

16. (Original) A tissue closure device according to claim 15 wherein the means for automatically driving further comprises means for increasing linear velocity of a sealing plug driver relative to the linear velocity of withdrawal of the closure device.

17. (Original) A tissue closure device according to claim 15 wherein the means for automatic driving comprises means for transducing a motive force generated by retraction of a proximal end of the filament from the tissue closure device to a linear tamping force upon the sealing plug.

18. (Previously Presented) A tissue closure device according to claim 17 wherein the means for transducing comprises a storage spool around which the proximal end of the filament is wound and connected, and wherein retraction of the proximal end of the filament from the storage spool rotates the storage spool and generates a torsional motive force.

19. (Previously Presented) A tissue closure device according to claim 18 wherein the means for transducing comprises a mechanical gear train for transducing the torsional motive force generated by the storage spool to the linear tamping force upon the sealing plug.

20. (Previously Presented) A tissue closure device according to claim 19 wherein the mechanical gear train comprises a first gear engaged with the storage spool, and a second gear engaged with the first gear and a tamping tube driver, wherein the torsional motive force of the storage spool drives the first gear, the second gear, and the tamping tube driver.

21. (Original) A tissue closure device according to claim 20, further comprising a gear ratio for increasing a linear velocity of the tamping tube driver relative to a linear velocity of withdrawal of the closure device.

22. (Previously Presented) A tissue closure device according to claim 20, further comprising a torque limiting clutch disposed between the storage spool and the first gear.

23. (Original) A tissue closure device according to claim 17 wherein the means for transducing comprises an electronic switch at the proximal end of the filament and coupled to a motor, wherein retraction of the filament from the closure device trips the electronic switch and activates the motor to tamp the sealing plug.

24. (Original) A tissue closure device according to claim 23 wherein the motor is a servo or solenoid.

25. (Original) A tissue closure device according to claim 17 wherein the means for transducing comprises an optical sensor operatively connected to a motor for detecting or measuring withdrawal of the closure device from the tissue wall puncture and generating a signal upon withdrawal of the closure device from the tissue wall puncture.

26. (Previously Presented) A tissue closure device according to claim 25 wherein the signal generated by the optical sensor is transduced to an electrical signal that activates the motor, wherein the motor generates the linear tamping force on the sealing plug.

27. (Previously Presented) A tissue puncture closure device for partial insertion into and sealing of a tissue puncture in an internal tissue wall accessible through a percutaneous incision, comprising:

an anchor for disposition on a distal side of the internal tissue wall;

a sealing plug for disposition on a proximal side of the internal tissue wall;

a filament connected to and anchored at a distal end to the anchor and sealing plug for slidably cinching the anchor and sealing plug together about the tissue puncture, wherein the sealing plug is slidably disposed on the filament proximal to the anchor;

a tamping tube disposed on the filament for driving the sealing plug along the filament distally towards the anchor;

a handle;

a storage spool located within the handle onto which a proximal end of the filament is wound;

a first gear engaged with the storage spool;

a second gear located within the handle, at least a portion of the tamping tube at least partially wraps around at least one of the first and second gears;

wherein withdrawal of the closure device from the tissue puncture retracts the filament from the storage spool and actuates the first gear to directly or indirectly provide a tamping force to the tamping tube.

28. (Previously Presented) A tissue puncture closure device for partial insertion into and sealing of a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 27, further comprising a rack disposed about the filament, wherein actuation of the second gear drive drives the rack, and wherein the rack drives the tamping tube along the filament distally towards the anchor automatically upon withdrawal of the closure device from the tissue puncture.

29. (Original) A tissue puncture closure device for partial insertion into and sealing of a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 27, further comprising a torque limiting clutch disposed between the spool and the first gear.

30. (Original) A tissue puncture closure device for partial insertion into and sealing of a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 27 wherein the rack is integral with the tamping tube.

31. (Previously Presented) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision, comprising:

withdrawing a closure device from the percutaneous incision;

automatically transducing a motive force generated by withdrawal of the closure device in a first direction to move a tamping member to provide a tamping force in a second direction, wherein the force is generated by an automatic driving mechanism located within a handle of the closure device, and at least a portion of the tamping member at least partially wraps around a gear of the automatic driving mechanism that is rotated with the motive force; and

withdrawing the tamping member from the percutaneous incision.

32. (Original) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 31, further comprising applying the tamping force in the second direction to a sealing plug.

33. (Original) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 32, further comprising transferring the motive force to a rack that is slidingly disposed about a filament, the filament being connected to the sealing plug.

34. (Previously Presented) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 33 wherein the transferring further comprises automatically unwinding the filament from a storage spool by deploying an anchor attached to the filament inside the tissue puncture, and withdrawing the closure device from the tissue puncture.

35. (Previously Presented) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 34 wherein the automatic unwinding of the filament from the storage spool comprises rotating the storage spool, and wherein storage spool rotation comprises the motive force.

36. (Previously Presented) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 35, wherein the transferring further comprises driving a gear train operatively connected to the tamping member with the storage spool.

37. (Previously Presented) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 35, further comprising limiting the transmission of torque with a torque limiting clutch disposed between the storage spool and the tamping member.

38. (Original) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision according to claim 31 wherein the motive force generated by withdrawal of the closure device from the tissue puncture is automatically transduced to the tamping force by an electronic or optical switch coupled to a motor.

39. (Previously Presented) A method of sealing a tissue puncture in an internal tissue wall accessible through a percutaneous incision, comprising:

providing a tissue puncture closure device comprising a tamping member, a handle, a driving mechanism, a gear, and a filament coupled to an anchor and to a sealing plug located proximal of the anchor for disposition and anchoring about the tissue puncture;

inserting the tissue puncture closure device into the percutaneous incision;

deploying the anchor into the tissue puncture;

withdrawing the closure device from the percutaneous incision;

automatically tamping the sealing plug with the tamping member utilizing force generated by withdrawal of the closure device from the internal tissue wall puncture, wherein the force is generated by the driving mechanism located within the handle, at least a portion of the tamping member at least partially wraps around the gear of the driving mechanism; and

withdrawing the tamping member from the percutaneous incision.

40. (Previously Presented) A tissue puncture system, comprising:

a tissue puncture closure device for partial insertion into and sealing of an internal tissue wall puncture, the device comprising:

a filament extending from a first end of the closure device to a second end of the closure device;

an anchor for insertion through the tissue wall puncture, the anchor being attached to the filament at the second end of the closure device;

a sealing plug slidingly attached to the filament and positioned adjacent to the anchor;

a tamping tube disposed adjacent to the sealing plug;

a handle located at the first end of the closure device; and

an automatic driving mechanism located within the handle that tamps the sealing plug utilizing force generated by withdrawal of the closure device from the internal tissue wall puncture to move the tamping tube toward the sealing plug, the automatic driving mechanism comprises a transducer for effecting movement of the tamping tube toward the sealing plug upon withdrawal of the closure device from the tissue wall puncture, the transducer comprising:

a spool with a portion of the filament wound thereon;

a gear engaged with the spool and arranged coaxially with the spool;

a tamping tube driver directly or indirectly driven by the gear;

a torque limiting clutch disposed between the spool and the gear.

41. (Previously Presented) A tissue puncture system according to claim 40 wherein the tamping tube driver is also the tamping tube.

42. (Previously Presented) A tissue puncture system according to claim 40 wherein the gear is arranged coaxially with the spool.

43. (Previously Presented) A tissue puncture system, comprising:

a tissue puncture closure device for partial insertion into and sealing of an internal tissue wall puncture, the device comprising:

a filament extending from a first end of the closure device to a second end of the closure device;

an anchor for insertion through the tissue wall puncture, the anchor being attached to the filament at the second end of the closure device;

a sealing plug slidingly attached to the filament and positioned adjacent to the anchor;

a tamping tube disposed adjacent to the sealing plug;

a handle located at the first end of the closure device; and

an automatic driving mechanism located within the handle that tamps the sealing plug utilizing force generated by withdrawal of the closure device from the internal tissue wall puncture to move the tamping tube toward the sealing plug, the automatic driving mechanism comprises a transducer for effecting movement of the tamping tube toward the sealing plug upon withdrawal of the closure device from the tissue wall puncture, the transducer comprising:

an electronic switch at the proximal end of the closure device; and

a motor operatively connected to the electronic switch, wherein retraction of the closure device from the tissue wall puncture trips the electronic switch and activates the motor to move the tamping tube toward the sealing plug.

44. (Previously Presented) A tissue puncture system according to claim 43 wherein the motor is a servo or solenoid that actuates a linear tamping force on the sealing plug.